Gas Journal

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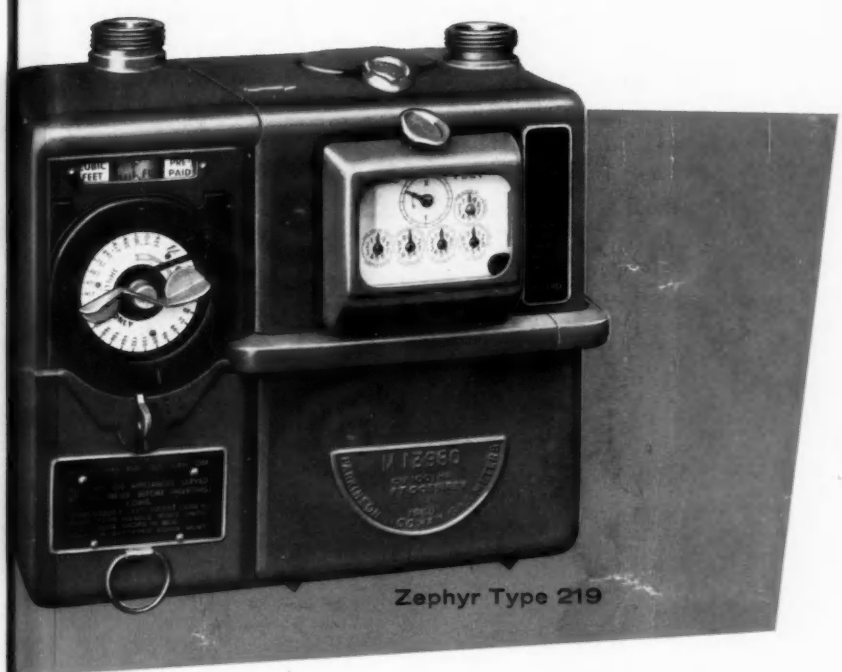

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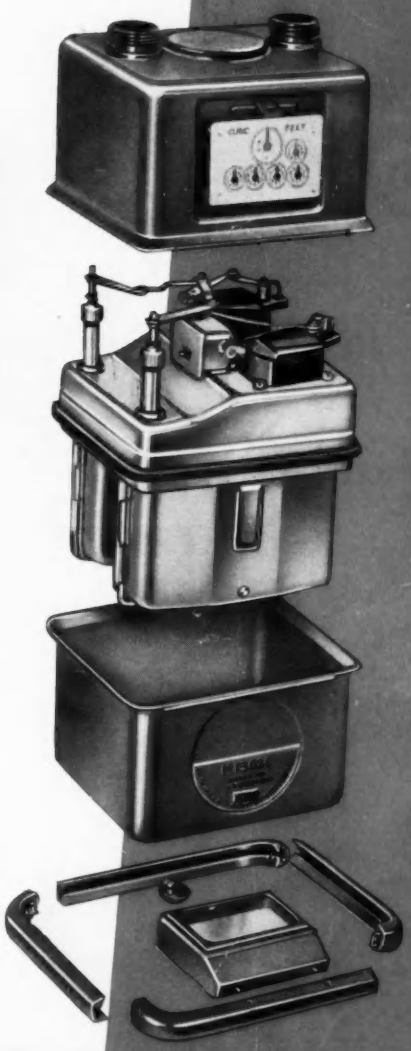

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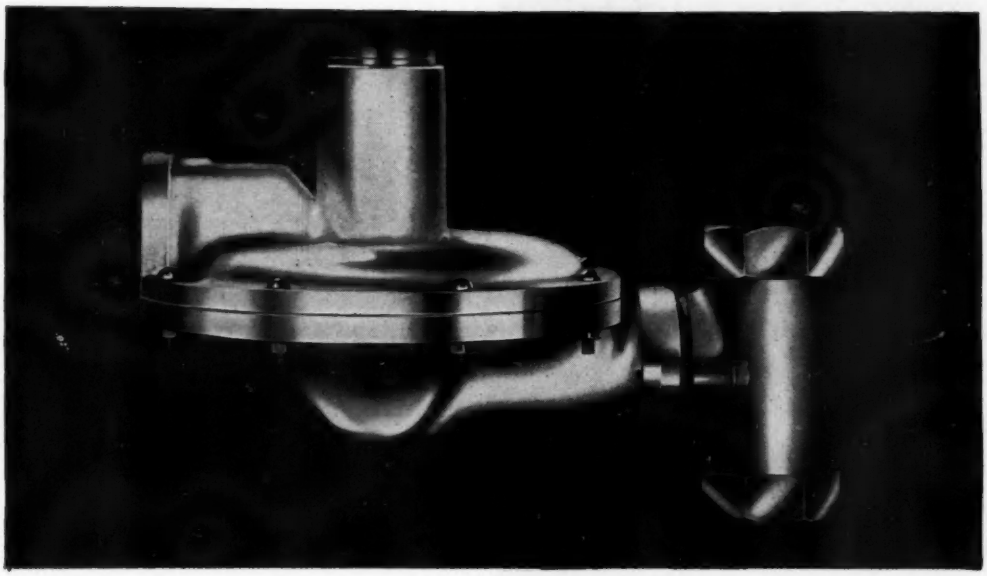

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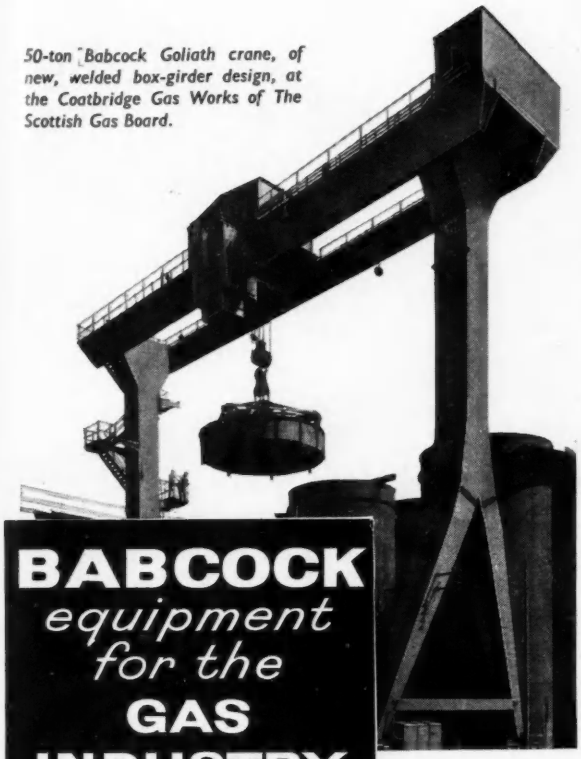

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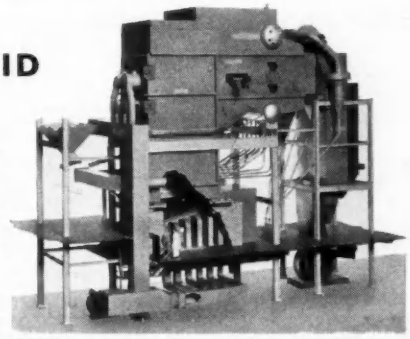

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Gas Journal

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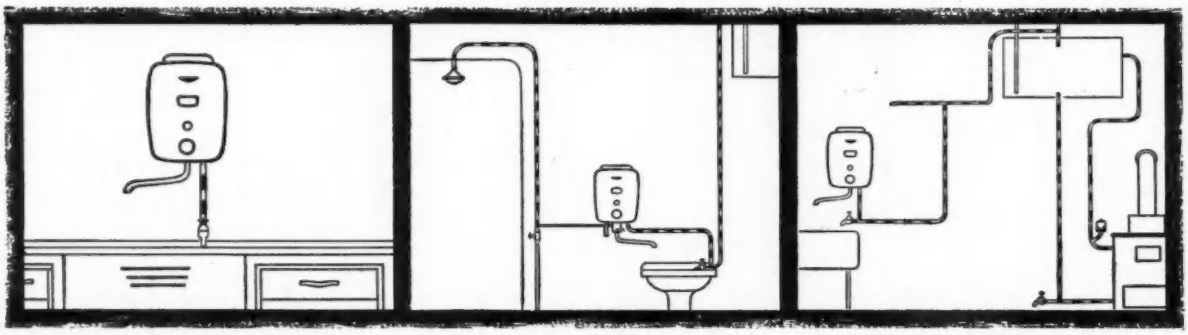

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Gas Journal

COKE OVENS • BY-PRODUCTS • CHEMICALS

The future rôle of premium smokeless fuels

THE part coke is likely to play in the supply of heat to the household of the future is extremely difficult to forecast. The use of coke for supplying hot water, the firing of domestic central heating boilers or doing both in a combined unit has become almost traditional over the years and especially since the modern coke boiler was designed to burn satisfactorily throughout the 24 hours. This was particularly so during the post-war period of acute coal shortage, when anthracite was almost impossible to obtain, though to a certain extent this particular shortage was met by the production of Phurnacite by the National Coal Board. The coal shortage, too, has contributed to the developments in grate design to enable coke to be burnt in the open fire.

Considerable progress has been made in exploiting these two outlets for coke by the gas industry and a great many 'all night' grates have been sold by the manufacturers, who have emphasised this particular aspect of the original designs of grates brought out by the South Metropolitan Gas Company in the early 1950's and those of the Gas Light & Coke Company some ten years later. The fact that they were designed to burn coke, however, did not prevent them from being used for burning coal or even wood logs.

Today the sales departments of the big international oil companies have foisted portable oil heaters on to a credulous public and they have also put forward with the utmost vigour, but in the best possible taste, the benefits to be gained from oil-fired central heating.

The gas industry saw how great the danger was to its own domestic load and launched a gas space heating campaign. Gas, the industry claimed, could provide house heating at least as effectively, and in the case of the small house, more cheaply than could oil, except possibly for the doubtful advantage of the portability of the room heater. With the development of small bore central heating by a gas-fired boiler and whole house warm air heating by gas, the rôle of the coke-burning appliance showed signs of becoming eclipsed.

The question we must now ask ourselves is what possible future is there for coke if gas is taking over so many of its traditional functions, in its battle for supremacy over oil? The demands for coke expected after the passing of the Clean-Air Act have not yet materialised and coke consumption generally has not increased as it was first hoped it would.

But many people still like an open fire and there are still a great many houses in the country far away from a gas supply which burn coke for space heating. If both these types of consumer, the former perhaps in a smoke control area, are going to remain loyal to coke, the quality of that coke must be high and remain as consistent as it is possible to keep it.

In a paper last week to the London and Southern Section of the Institution, Mr. G. H. Fuidge, Manager of the South Eastern Gas Board's Central Laboratories explained what his Board were doing to maintain the consistent quality of the coke it sells and to ensure that it is up to the appropriate British Standard specification. He commented on the importance of the tests laid down and the type of control to be exercised at the gasworks. In the South Eastern Board's area, the whole of the carbonising plant is static and the kind of coke turned out by these plants—coke ovens, horizontals or intermittents—when using high rank Durham coal, is less reactive than coke made from lower rank Yorkshire coals in a continuous vertical plant. Such low reactive coke can be burnt successfully in the hot water or central heating boiler, though great care in grading is needed when it is used in the smaller, thermostatically controlled hot water boiler. It is, however, much less satisfactory when burnt in the open fire. With static plant the production of a premium fuel of the Cleanglow or Phimax types, using lower rank coals, is not possible, but experiments with certain blends of these coals with high rank Durham gas coals showed that more suitable cokes could be made. To push the idea to its logical conclusion, it was decided to blend the high rank coal with peat. Blends up to 7% of Irish peat gave much more reactive cokes but with a bulk density equal to that of normal static coke.

Thus Sebrite, an M coke with many L coke characteristics, began to make its appearance from the gasworks at Wandsworth and Croydon, and the standard tests showed its greatly increased reactivity over coke made from the straight coal.

The commercial success of all types of premium fuels

is quite evident from the increase in demand for them in the last three years or so since Phimax and Cleanglow were introduced, and there is every reason to believe that the demand for Sebrite is increasing equally rapidly. This point, however, was not made clear in the paper; in fact, no mention was made of production figures, either in the paper or in the discussion which followed it.

It might appear that the continuance of domestic sales of coke for the open fire, in the South Eastern area at any rate, depended on the expansion of sales of more reactive cokes. Does this mean that they may even supersede the more normal coke for the smaller coke-burning domestic appliances, particularly the smaller hot water boiler, during periods of low hot water demand? If this is so, is the whole sales policy for what is generally termed 'gas coke' only short-term?

The South Eastern Board have been particularly quick to realise such a possibility in the past and were pioneers in the building of a large base load oil gas-making plant. It saw that the price of gas should not be influenced by an advantageous income from coke sales. It has, in fact, been one of the first boards to begin to make itself independent of such incidental revenue.

In the discussion that followed Mr. Fuidge's paper, several speakers commented on the value of coke sales in assisting gas prices; perhaps the introduction of Sebrite has served to reverse a deteriorating situation. We were interested that Mr. R. N. B. D. Bruce, Chairman of the South Eastern Board, who was present, should have made the point that he saw no reason why the premium charge of 8s. 4d. a ton for Sebrite should be any hindrance to its sale. He said that the increased incomes of today encouraged the householder to pay a little extra for superior quality. This was true of Sebrite and other premium fuels. True though this undoubtedly is, we cannot help feeling that it might react unfavourably to solid fuels in the long run.

Space heating—a note of optimism

THE policy of the South Eastern Gas Board is such that any discourse on its solid fuel sales is bound to be of interest. It is all the more interesting in view of the Board's success in building its gas space heating load—a load on which much of the industry's future prosperity must depend.

Just at the moment things are not as bright as they might be. The indications are that the gas industry's results for the current year will be no better, and may well be worse, than last year. This we regard as reason for quick, imaginative thinking and bold action, but not for dismay. There is, we believe, a solution to the problem of falling domestic consumption, a solution which is within our grasp. We are, of course, referring to the establishment of gas as the favoured fuel for continuous room heating, an objective which can almost certainly be reached if the proper action is taken now.

One of the first requirements is a voice of hope and encouragement, since there are still many in the industry who, whatever protestations they may make concerning their confidence in gas as the ideal fuel for space heating, certainly do not act as prophets of a new service to mankind. Fortunately we have one or two people who by their enthusiasm and their ability to convey it are doing an invaluable service to the industry. One of these is Mr. J. D. C. Woodall, Sales Manager of the South Eastern Gas Board, who can usually be relied upon to produce something rousing and imaginative.

Last month he presented a paper ('New Markets for Gas in the Home') to the London and Southern Section of the I.G.E., which is worthy of careful reading not only by those whose work is connected with appliance sales but also by all for whom the industry's future is a matter for concern. We publish the paper in full in *Gas Service* this month, together with a report of the discussion which followed its presentation. In these notes we proposed to underline some of the most significant passages.

Mr. Woodall points out that, despite its many advantages, gas has not in the past been used to any extent for continuous space heating, due in the main to the high cost of gas compared with solid fuel. However, because of the Clean Air Act and the more favourable ratio between the solid fuels and the refined fuels today, there will be an increasing demand for fuel in a more convenient form. Before gas can grasp this growing load two vital pre-requisites have to be met: A really promotional two-part tariff must be made available to domestic consumers, and the gas sales staff must be firmly convinced of the advantages of the gas room heater over all other methods of continuous heating of the living room.

In the case of the South Eastern Board the first of these pre-requisites was provided in 1955 by the introduction of a domestic two-part tariff. The second, says Mr. Woodall, has taken longer, but lingering doubts have now been dispelled. Today, 'as a result of the great improvement in the efficiency of our gas room heaters, improved methods of installation and the introduction of domestic tariffs, the comparative running cost of gas for continuous room heating is appreciably less than that for coal or electricity, and is even lower than that for coke burnt in an open grate. Only the more efficient coke-burning appliances, such as convector coke grates and openable stoves, and the unhygienic portable oil heaters provide cheaper heat than the gas room heater. Whatever our rival fuel interests may claim from their comparative figures of cost it has now been amply proved in practice that the cost of gas for living room heating compares favourably with that for all other competitive fuels.'

Cheering words! And Mr. Woodall backs up his arguments with some figures. Between 1954 and 1958 his Board sold about 10,000 gas fires a year; in 1958-59 22,000 were sold, and this year the total should exceed 30,000. A high percentage now being sold are for fixing in the main living rooms; indeed, a survey on heaters sold during September, October and November, 1958, has shown that 63% of these fires were fixed in

main living rooms and a further 26% in subsidiary living rooms. It was further shown that gas only replaces coke in a small minority of cases, and there were indications that in many cases a supplementary oil or electric appliance was also displaced by gas in addition to the main fuel. Approximately 40% of the room heaters fixed in living rooms were in households where the occupants are out all day. It was estimated that the average annual consumption of such heaters installed in the principal living room was 130 therms; for various reasons this consumption was thought to be exceptionally low. Customer satisfaction was very high and Mr. Woodall describes these room heaters as potent silent salesmen for gas. He adds, 'If in the next five years we can sell 200,000 gas room heaters in our area, which I believe is well within the bounds of possibility, they will produce an increase of approximately 10% in the annual gas output of the Board.

From room heaters, which certainly offer the best market for increasing the gas load, Mr. Woodall turns to central heating and warm air heating, both systems which hold a rich promise for the future. These have been widely publicised and we do not propose to mention them in detail on this occasion. However, part of the closing passage is worthy of quotation:

'Although as yet gas has made only a small impact on the vast heating market, we can take encouragement from the steeply rising trend in the sale of all gas space heating appliances. In the South Eastern Gas Board area there are clear indications that the domestic gas load is beginning to rise. Both in the years 1957-58 and 1958-59 we recorded a slight increase in domestic consumptions. Although owing to the exceptionally warm weather we may not achieve a further increase this year, that the increased space heating load is having some tangible effect is indicated by the figures showing the Board's output of gas during two successive weeks this January, for each of which the average temperature was identical with last year.

'If, as I believe possible, a substantial new load for gas can be obtained from domestic space heating, our future is assured. Just as we hope to double our standard of living in 25 years, so should we aim to double the output of gas. That this is not pure crystal gazing is indicated by the fact that the thermal equivalent of the 40 mill. tons of solid fuel now being burnt annually in domestic premises is equal to twice the gas industry's present annual output. If only half of this sold fuel is converted to gas in 25 years we shall more than achieve our aim.'

The N.C.B. loan scheme

LAST week's news of the National Coal Board's plans to introduce a five-year loan scheme for the purchase and installation of solid fuel-fired appliances and central heating systems is the first real evidence of the Board's determination to find a new key to public favour and combat competition from oil.

The arrangements made with the Forward Trust, which is jointly owned by the Midland Bank and the Clydesdale and North of Scotland Bank, offer two features which the N.C.B. clearly hopes will give it a competitive edge. The first is the rate of interest, which has been fixed at 5% per annum, a lower rate than that required by some other schemes. The second is the fact that loans will cover any appliance costing more than £20, though if the price is below £50 the repayment period will be less than two years. The loans replace an old credit terms plan which involved paying a deposit and interest at 7½%. Under the new scheme any appliance costing more than £20 can be installed upon payment of the first monthly instalment.

The new scheme applies to all modern domestic solid fuel appliances, whether for dwelling houses, office blocks or shops. Small industrial installations, such as laundries, are also included in the scheme, though presumably larger businesses should be able to make more economical arrangements than by the scheme. The credit plan will initially apply to purchase and installations by dealers on the Coal Utilisation Council approved list.

That the N.C.B. expects industrial users to take advantage of the scheme is clear from an article in the *Guardian* by A. Alan Taylor, Manager of the Board's Sales Development Branch. He describes the scheme as 'another development of the coal industry's new outlook on selling,' and maintains that 'it should further encourage users to bring their plants up to date on coal. Though mainly intended for domestic consumers, the plan will also apply to the requirements of semi-industrial and industrial users for the installation of modern plant and equipment for using or improving the use of solid fuel, and will be available on the same terms as those for domestic users.'

This ties up with the remarks made recently by the Minister of Power, Mr. Richard Wood, in the Commons: 'It is most important for industrial costs that consumers who may be contemplating a switch to oil should not base their decisions on a comparison between the existing coal plant which they happen to have and the latest oil-burning plant which they may have in the future,' he said. 'I am not quite convinced that they have considered the very real advantages in labour savings, cleanliness, and low cost of the latest coal-fired equipment.' He went on to say, 'I am convinced that for a large part of our industrial activity coal remains, and is likely to remain, the best economic proposition in industry's own interests, and, in the ultimate interests of consumers.'

Clearly coal, which as Mr. R. H. E. Thomas of the N.C.B. admitted recently is 'unfashionable' and 'not a snob fuel,' is setting its cap both at the domestic and the industrial user.

It is interesting to see a nationalised industry—particularly one which has lagged behind in the competitive dogfight—boldly facing up to the flexible and powerful forces of private enterprise. The point is that what coal can do, gas can do at least as well. We understand that negotiations are taking place between area gas boards and finance houses with a view to offering similar facilities. This is gratifying, but we feel bound to ask, why did not the gas industry do it first?

Important pointers from

the French Technical Press

GAZ DE FRANCE SALES CONTINUE UPWARD TREND —DESPITE UNCERTAINTIES

THE first estimate of the sales by Gaz de France in 1959 is about 628 mill. therms, an increase of 1.7% over that of 1958. This increase is lower than that of previous years, as 1959 was characterised by the highest mean temperature recorded for 80 years. But for this the increase would have been about 3.65%, says the *Journal des Industries du Gaz* for January.

In spite of uncertain economic factors, sales of gas in the industrial sector were 3.1% higher than in the preceding year. There was an acceleration in the number of consumers gained: 145,000 in 1959 against 137,000 in 1958, bringing the total to 5,430,000. The slowing-down of sales of coke, however, has persisted.

The industry cut its coal usage by 11%, while buying 15% more petroleum products and 9.4% more gas from sources outside the gas industry.

Case-hardening plant

M. Claude Bickart, 'Engineer to the Commercial Directorate' of Gaz de France, describes in this issue of the *Journal* a large gas-fired case-hardening plant installed by the manufacturers of the Simca car at their new Poissy works. Production of this car reached a figure of more than 200,000 in 1958. An output of 1,000 vehicles a day was planned for 1959.

It is claimed that the two lines of gas-fired cementation and carbonitriding furnaces, brought into service in 1957 are the finest in the world. The maximum consumption is stated to be about 19,425 cu.ft. an hour of coke oven gas supplemented by about 706 to 1,900 cu.ft. an hour of RX gas from atmospheric producer gas for firing the catalyser chambers. The plant is described in considerable detail with photographs and drawings.

Natural gas delivery

An account is given of the first delivery of natural gas to the town of Limoges. The gas arrives in a steel main 150 mm. in diameter at a pressure of nearly 15 atmospheres, which is reduced at the point of reception to about 3 atmospheres. It is subsequently distributed to medium and low pressure points in central divisions and to porcelain manufacturers. Distribution will be at 200 mm. water pressure. New tariffs have been introduced which reduce charges by between 20% and 50%.

The effect of the December Côte d'Azur and Fréjus disasters on gas supply is described. One consequence was the delay in the distribution of propane/air which was to have commenced in Fréjus on December 7.

Landy research lines

The second annual series of the chronicles of the department of research and new techniques of Gaz de France is concluded with an account of the new equipment and lines of research at Landy.

The group of operational research is pursuing, in collaboration with the Society of Applied Mathematics, a study of the economics of leakage, using a mathematical model to determine the optimum economic interval between two successive operations of research into and repair of leakage in a given distribution network.

A statistical study is being made of the emission of gas in the Paris region and different factors affecting it. It has been possible to define a 'fictitious temperature' derived from these factors. Differences between real and theoretical emission will permit the evolution of consumption of gas to be followed during the winter.

Tests have been carried out on the use of electronic numerical computers for the study of problems of distribution networks and the flow of gas under varying conditions. Applications are being sought in wider fields of future development, for example, that of the behaviour of a submarine pipe-line.

An experimental generator has been set up at Landy for the investigation of the many problems arising from the reforming of a wide range of petroleum products. There is also a pilot installation for the rectification of liquids at atmospheric pressure and under vacuum.

Analysis of substances

Some new equipment at the Landy Centre is described. Application of the *zone fondue* technique permits analysis of substances of very great purity as required in standardisation of such apparatus as spectrography, chromatography, cryoscopy. The apparatus is composed essentially of a glass tube containing the substance to be purified, small electric retorts separated by refrigerants and an arrangement of entrainment permitting automatic displacement from the tube in relation to the retort-refrigerant assembly. In the course of the displacement the 'zone of fusion' is itself displaced towards one of the extremities where the impurities accumulate.

A portable flame-type spectrophotometer has been developed to detect the accidental presence in gas from storage underground at Beynes of substances which give rise to

such inconveniences as the blockage of certain pilot flames. A description of the principle of the apparatus is given. Extensive new apparatus for the control of refractory materials has also been installed.

Hydrocarbons from Sahara

The December issue of *Chimie & Industrie* reports an address by M. Roger Goetze, President of the National Society for Research and Exploitation of Petroleum in Algeria. After describing the work already carried out in the subsoil of the Sahara and comparing the cost of this work with that of similar preliminary work in the United States of America and in the Middle East, the President discussed in detail the part which the hydrocarbons from the Sahara might play in the equilibrium of energy supply in Europe and in France in particular, in view of the problems inherent in the transport of petroleum oils and gas. 'Does the Sahara contain a veritable gold-mine or is it merely one of those mirages of the desert? ' he asks.

After a brief description of the achievements to date, M. Goetze concludes: 'Thus, less than four years after the discoveries at Edjeleh, less than six years after the beginning of exploratory work in the Sahara, we can affirm that reserves already proved attain 475 mill. tonnes of oil with a total of probably 700 mill. To these reserves of oil must be added 100 mill. tonnes of gasoline and 800 milliards of cubic metres of gas.'

On the cost of prospecting for and discovering deposits of petroleum, he remarks: 'In the United States it was for a long time the rule that "a barrel in the ground" was worth a dollar. This sum formerly included the cost of development. Now the cost of search and location is rising. According to a report of 1957 by the Chase Manhattan Bank, this dollar covers the search only: 3,750 F. (heavy Francs) are required to discover one tonne of recoverable oil. The petroleum of the United States is thus one of the dearest in the world. On the other hand, so large are the quantities available in the Middle East that it is practically impossible to evaluate the cost of discovery but it is estimated that the cost of a "a barrel in the ground" is about 4 or 5 cents or, say, 160 F per tonne.'

View 'too simple'

In the Sahara, if the expenses already incurred were divided by the weight of reserves proved, the cost was of the order of 250 F. per tonne, he said. But this view of things would be too simple after a series of lucky strikes, costs would become heavier and it would be more normal to calculate the value of replacing the deposits revealed, relating the cost of search to the actual value of production during a period. 'This would give a figure of 800 F. per tonne, which we consider more reasonable, i.e.: 800 F. is to be compared with 3,750 F., as symbolic figures, so that the petroleum of the Sahara, from the point of view of the cost of research and proof, is very favourably placed.'

But to know whether this oil was really competitive it was necessary to estimate the cost of exploitation. After discussing the possibilities of raising the very large sums of money involved, M. Goetze turned to the two extremes of cost in the exploitation of petroleum. In the United States the cost of exploitation, including that of prospecting and proving, was estimated in 1952 to be of the order of 8,000 F. per tonne at the ruling rates of exchange. In the Middle East, from less accurate available information, he concluded that the comparable figure was of the order of 1,300 F. It had to be borne in mind that in the U.S.A. the average production was less than 2,000 tonnes a year, while in the Middle East it was about 250,000 tonnes.

He could not put a price to Saharian oil since no field was yet in full production; they had to wait at least ten years before they would know how the different deposits worked out. But some general ideas emerged.

Selling Sahara oil

M. Goetze examines in detail the problem of selling Saharian oil in a world market already saturated. Very large capital investments would be involved which were likely to meet with stiff resistance on the part of existing producers—particularly in America and Russia—but with a favourable reception in France and countries of the O.E.E.C. where the energy deficit was considerable.

There was, however, a technical difficulty. 'Saharian petroleum is too rich in white and not rich enough in black products; it does not conform readily to the requirements of the national market and can only be treated in the refinery at the cost of expensive complications.'

Crude Saharian oil, on the other hand, contained only 20% of fuel oil for 40% petrol. These figures were not definitive, but it could be said that Saharian oil was about 10% too rich in petrol and 10% too poor in heavy oils. The difficulty was not insuperable. Uses of the several grades of fuel could be switched round. 'Light oils can be used for the production of town gas and Gaz de France is already studying this.'

In the U.S.A., Canada and Russia, the future belonged to natural gas. When Saharian gas was spread over Europe in milliards of cubic metres there would be activity comparable to that in the U.S.A. provided it was at acceptable prices. For the moment the Government was preoccupied with the maximum use of the gas in Algeria, where it could be said that gas would be the cheapest in the world. But consumption would be very much less than production and the problem of exportation was pressing. M. Goetze discussed three possible solutions 'in the order in which they are technically realisable'—transformation into electric current, liquefaction, and transport by trans-mediterranean pipe-line.

Current would be generated in thermal stations in Algeria and transmitted by submarine cable as continuous current at 50,000 v. But capital costs were very high. Liquid methane would create the European market in natural gas, but the true instrument of large scale transport could only be the pipe under the Mediterranean. To be able to transmit gas as it was from Africa to Europe, they had to learn how to lay mains on the bottom of the sea, which had never been done on such a scale. The technical solution of the problem awaited long and minute study, not only of the type of piping to be used but of the methods of laying it.

Two routes had been to some extent reconnoitred, one by Gibraltar, some 12 miles west of the Strait, the other from Mostaganem to Carthagena.

Submarine pipe-line

Market potentials and probable costs are examined. An interesting remark is: 'There remains the case of Great Britain which has large needs—about 450,000 mill. cu.ft.—but we do not know yet what will be the method of supply preferred by the English, methane-ship or another pipe-line' (presumably under the straits of Dover). However, 1962 would probably see the first liquid methane shipment, and perhaps 1965 the submarine pipe-line and an assured market of about 525,000 mill. cu.ft.

The question was, says M. Goetze, whether in view of the roughly equivalent capital costs of these two modes of transmission, both should be used. 'Without hesitation, I reply, yes.'

GAS JOURNAL March 23, 1960

From a paper to the London and Southern Section of the I.G.E., January 19, 1960.

Electronics in the gas industry

By M. NEEDHAM,

JOINT GENERAL MANAGER, ELLIOTT BROTHERS (LONDON) LTD.

and

J. H. WHITAKER,

LATELY SALES DIRECTOR, PANELLIT LTD.

Part 1

CONTINUOUS processes of the type found in the gas, chemical and oil industries are critically dependent upon a wide range of measurement and control apparatus, the greater part of which is based upon the use of pneumatic techniques. These techniques are basically simple and the equipment is robust, reliable and well understood. Occasionally, in the past, it became essential to deviate from these well-tried methods and, here and there, instruments based on electronic methods were introduced for certain measurements. Examples of such instruments include those for the measurement of *p*H, conductivity, etc., for which purpose no other method is practicable. There has, however, been a marked reluctance to use electronic methods unless some very pressing occasion existed. This reluctance can be traced, in general, to a widespread belief that electronic equipment is delicate and incapable of reliable operation in adverse plant conditions. In addition, the techniques have not been widely understood by plant designers and there has been a severe shortage of technicians skilled in the maintenance of electronic equipment.

Enormous fund of knowledge

Developments in other fields, such as radar, communications, aviation and missile controls, have, in contrast, been wholeheartedly electronic. In fact, of course, these things could not have come about any other way. The tremendous war-time and post-war activities in these fields have created an enormous fund of knowledge and experience and, what is vitally important, a wide variety of apparatus and components are now in large-scale production and designed to satisfy very exacting specifications. As a result several manufacturers have been able to develop electronic process control equipment fully able to perform all the operations previously in the almost exclusive domain of pneumatic methods. Considerable field experience can now be quoted to demonstrate the achievement of a high order of reliability. In the past two or three years more and more plants have been planned on the basis of full electronic control and it is interesting to consider some of the special factors which have led to these decisions.

In the continuous process industries the trend has been in the direction of larger throughputs, closer control of product quality and a continual striving towards improved efficiency of production. As a result very large plants are frequently erected and in these plants the number of control loops run into hundreds. As well as the traditional parameters such as temperature, pressure, flow, etc., numerous other variables, particularly those of product or raw material quality, are also measured and used as a basis for control.

The large plant is generally most efficiently operated with the aid of a single centralised control room. In a new oil refinery, now being commissioned in Rotterdam, the control room is some hundred feet square and houses all indication and control equipment including that for the three oil- and gas-fired boilers. Such a large plant occupies a great area and measurement and control signals must be transmitted over very long distances. This fact poses a number of problems if conventional pneumatic equipment is used. For example, the cost of installation of so much pneumatic tubing is very large; the open nature of the plant leads to the possibility of freezing of condensed moisture in the tubing with consequent blockage and the large transmission lags complicate the attainment of control loop stability with simultaneous fast response.

Although pneumatic techniques can be employed for many basic control applications the increasing number of cases, where electrical or electronic apparatus must be used, leads to a mixed bag of instrumentation with the frequent need for conversions from electrical to pneumatic data and sometimes *vice versa*. This is particularly relevant when automatic data handling techniques are also to be employed.

A further reason for considering electronic methods arises from maintenance considerations. As will be seen later it is fairly simple to construct the equipment in the form of a number of plug-in units which can be easily removed and replaced should a fault develop. Field maintenance is then reduced to a process of fault location to a given unit—usually a relatively simple matter—and subsequent repair work, demanding skilled technicians, can be restricted to a central maintenance room or, if desired, to the manufacturers' works.

Firms with experience

As a result of considerations, such as these, there has been a marked swing towards electronic equipment in some industries during the past few years. Several instrument firms have now had nearly a decade of experience in the production of equipment. These include Evershed & Vignoles Ltd. in England and Maning Maxwell & Moore and the Swartwout Company in the U.S.A. Already oil refineries, chemical plants and boilers in the U.S.A. and Canada have been satisfactorily operated using the products of these firms. At this moment refineries with Swartwout electronic control are being commissioned in Rotterdam and Montreal. Recently a major power station in

England was put satisfactorily to work with Evershed electronic boiler controls and the second stage gas from oil plant at the Isle of Grain will have Swartwout controls on the boilers and some process plant.

More recently other well-known firms, notably Taylor Controls, Honeywell-Brown and Foxboro, have introduced comprehensive systems.

Summarising the position today one can say the electronic process control is an established fact. There are, however, those who are all for it and those that are definitely against it. There is also, no doubt, a 'floating vote' of 'don't knows.' This condition is the expected one in the course of introduction of a new technique and no doubt the opposition stimulate much useful discussion and careful investigation. It does seem now, however, that the stage is set for a new approach in which plant designers accept reliable electronic equipment as an established tool to be considered on its merits along with all the others at their disposal.

Having thus briefly discussed some of the reasons for thinking in terms of electric techniques let us now consider what can be done with them and how some of the devices operate. This is clearly a very wide subject and the discussion is limited to a few general principles together with some typical instruments and systems by way of illustration.

Most plant control depends on a closed-loop system consisting of a measuring element, a control element and a controller. In the design of such a control system using electronic techniques a choice of methods is available for each of the elements. These affect the transmitted signal, measurement methods, the controller and control elements.

With pneumatic methods, data are conveyed by the transmitted signal in terms of pressure variations so that standardisation is relatively easy, but when an electrical signal is used a wider choice exists. Data can be conveyed in terms of current or voltage variation, or, if alternating current is used, by frequency or phase modulation. If pulsed signals are used, amplitude and rate or width modulation are possibilities, or a coding system can be employed. Some of these alternatives have been used for long-distance telemetering, but in commercially available control systems, of the type being considered here, the transmitted signal is either a direct current or an alternating voltage.

Before examining the relative merits of these signals it is necessary to go further into the general principles involved in the various sections of the control loop. In process control the most frequently used measurements are those of temperature, pressure, flow rate and liquid level.

Resistance thermometers and thermocouples are already widely accepted and are obvious choices for electronic systems. The resistance thermometer may be excited with either a.c. or d.c. and so is suited to systems using either form of transmitting signal. On the other hand the thermocouple is essentially a d.c. output device and its use with an a.c. system is complicated by the need for conversions to an a.c. signal.

Two general methods are used for the measurement of either displacement or force which are summarised in Fig. 1.

In the first, or displacement method, an electrical pick-off capable of accurate, linear measurement of displacement is used. The use of suitable linkages extends the range of displacement measurement or enables rotations to be accommodated. A force being measured is opposed by a linear spring and the resulting displacement is measured directly. Since the pick-off can be highly sensitive the spring motion can be small.

Importance of method

The second, or force-balance method makes use of a force motor instead of a spring. This is usually a coil moving in the field of a permanent magnet and is arranged so that the force on the coil is proportional to the d.c. flow in it. A force being measured is opposed by that of the force motor and the current is adjusted until a balance is obtained. This condition is automatically achieved by detecting the force motor movement with a displacement pick-off whose amplified output provides the current to the force motor. The force motor, pick-off and amplifier then behave like a spring and the force motor current is a measure of the applied force. With a high loop gain only very small movements are necessary. The importance of the method lies in the fact that the pick-off need not be very linear or stable.

To measure a displacement with the force-balance method, a stable linear spring must be introduced so that a force proportional to the displacement is applied to the force motor and measured as before.

It should be noted, in the force-balance method, that practical currents and magnet field strengths limit the resetting force, and when large forces are measured a large mechanical magnification of resetting force may be necessary. For some requirements a succession of magnifying levers or a complex linkage must be used, and errors due to friction may then be significant. With the displacement type no such restriction applies and a simpler, more robust design can be realised. In the equivalent pneumatic instruments a large resetting force is possible and the force-

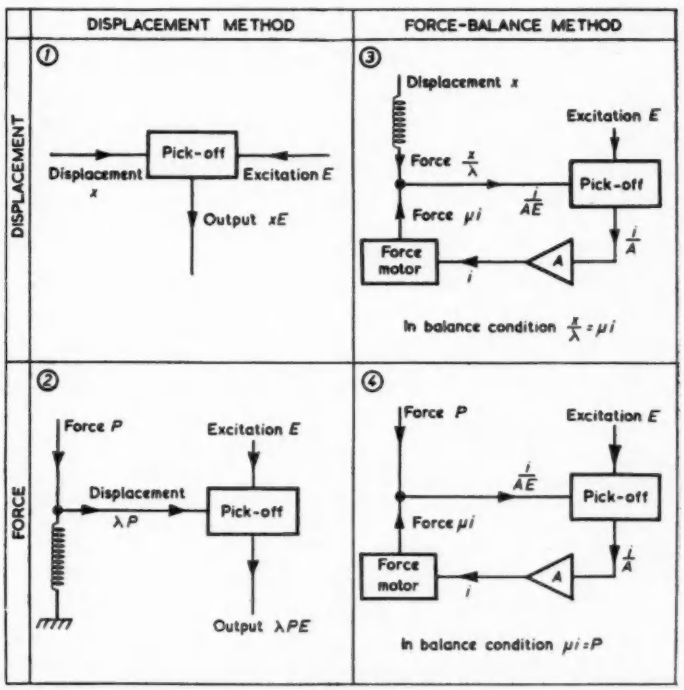


Fig. 1.

balance method may then have a considerable virtue.

Suitable displacement pick-offs are differential transformers, variable capacitors and variable inductors. These are all essentially a.c. operated devices and indeed, for d.c. operation, no suitable sensitive linear pick-off is available. For this reason the simple displacement method is restricted to the transmission of a.c. signals while for systems with d.c. transmission the force-balance method must be used.

The most suitable pressure transducers make use of conventional bellows, diaphragms or capsules. The resulting forces can be measured using either force-balance or displacement techniques as described above. The basic arrangments are shown in Figs. 2a and 2b. Absolute and differential pressure can be measured with similar devices.

Level transmitters using floats or displacers provide a displacement measurement problem which again can be solved by either force-balance or displacement methods.

When the force-balance measurement method is employed indication can be simply arranged by using a moving coil milliameter to indicate the force-motor current. The indication so given will be independent of line resistance, but limited in accuracy to that of the meter. In the displacement method the pick-off is generally not suited to direct operation of a meter and some power amplification is required. This may, however, be quite simple and require only one thermonic valve. Where precision indication or recording is required some servo-driven self-balancing arrangement must be used. An arrangement that is suitable for use with the displacement method employing differential transformers is shown in Fig. 3.

The controller is required to derive the difference between the measured variable and the set-point value and the resulting signal must be suitably amplified so as to provide suitable power for the operation of the final control ele ment. Unless the measured variable and set-point signals

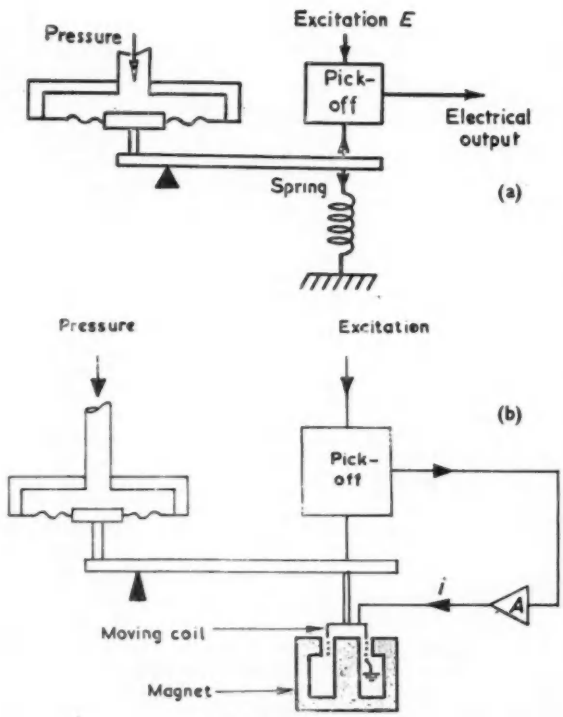


Fig. 2.

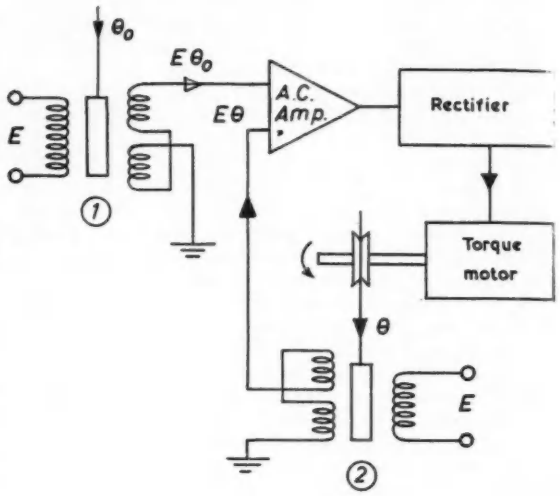


Fig. 3.

are very large, the difference signal will be small and care must be taken to avoid errors due to amplifier drift. If a.c. signals are used, such a drift problem is not encountered so that an a.c. error amplifier suggests itself. This also leads to a simple method for providing the difference signal by feeding the two input signals to grid and cathode respectively of the input stage. However, should it be required to introduce rate and integral terms it is necessary to convert the error signal into a d.c. signal. Resistance capacitance feed back networks may then be used to generate the required actions.

Probably no hard and fast judgment can be made as to whether the a.c. or d.c. system is the best form of transmitted signal to employ. However, certain facts may be stated:

1. From consideration of the controller and the need to introduce rate and integral terms a d.c. signal output seems inevitable.

2. From consideration of measurement transmitters essentially measuring a displacement or force, *i.e.*, pressure level, etc., the displacement method is simpler and hence an a.c. signal is indicated for the transmission of this data.

3. Temperature can be most simply measured using a resistance thermometer in which case an a.c. or d.c. signal can be used.

4. Where thermocouples are used, d.c. transmission is indicated otherwise some means of conversion to a.c. is required.

The equipment described so far provides for measurement indication, recording and the generation of a control signal—generally a direct current. How is the control signal caused to operate the final control element?

This is normally a fluid control valve and at present it is generally most convenient to use the conventional pneumatically operated type. To do this a means for converting the d.c. signal to a standard 3 to 15-p.s.i. loading signal is employed. The basis of this unit is a force-motor using a moving coil and a permanent magnet. The control d.c. flows on the moving coil and the resulting force on the coil operates a suitable pneumatic relay.

In an attempt to remove the need for air completely electrohydraulic operators with self contained electric motor driven pumps have been developed and several versions are commercially available.

Part II will be published next week.

From a contribution to an Eastern Junior Gas Association short paper competition.

The control of dust on gasworks

By F. A. BOWMAN,

CAMBRIDGE, EASTERN GAS BOARD.

THE control of dust and smoke from a gasworks is a problem, which, although it has been with us since the early days of gas making, has become more urgent in view of the Clean Air Act of 1956, and because other factory owners, shop-keepers and residents in the neighbourhood of the gasworks have become more conscious of the cleanliness brought about by the improved standard of living.

The Clean Air Act applies to a gasworks in so much that Section 1 totally prohibits the emission of dark smoke; dark smoke is defined in the Act as smoke which would appear to be as dark as shade 2 on the Ringlemann chart. Other smoke is not permitted for a period longer than that specified by the Minister, but with this type of smoke it would be a defence, if the contravention complained of was solely due to some unforeseen failure of the plant producing the smoke, or if the offending plant was being lit up from cold, or that unsuitable fuel was being used because no other was available.

Section 5 states that every building in which an oven is used to subject solid fuel to heat must contain every practical means to minimise the emission of grit and dust.

Then in Section 17 it is laid down that if any gas making process is scheduled to the Alkali, etc., Works Regulation Act (1906) any emission of smoke, dust, etc., is liable to receive the attention of the Alkali Inspector in the same way as any noxious gases would.

From these few remarks about the Clean Air Act it is obvious that it must be treated with considerable respect. Clearly the dust problem in no two gasworks is alike since there are so many things to differentiate between them. Some have modern, and therefore cleaner plant; some have an extensive area on which the works are built; some are built well away from residential areas, while other works may be just the reverse. Whichever category the works comes under it is nevertheless desirable to reduce the emission of dust to a minimum.

Sources of smoke and dust emission

What are the main sources of dust production in a gasworks? Probably the process of gasmaking, including the working of the producers, the transport and storage of coal and coke, the sizing of coke for the market, the use of solid fuel-fired boilers, and to a somewhat smaller extent, the breaking of oxide. Water gas plants can also cause trouble if the grit arresters are not kept in first-class condition.

With a modern continuous vertical retort house, fitted with a dust extraction plant, the main sources of dust emission are during the filling of retorts with coke after scurfing, during the cleaning of the waste heat boiler tubes and bad operation of the dust-washing plant, allowing the collected dust to bye-pass the washers and so enter the atmosphere.

If the continuous vertical retort house is provided with mechanical producers, this part of the plant will be practically dust-free, the only possible source of dust being at the point where the coke chute feeds the travelling producer charging skip. Some 'blue haze' and light smoke will appear when retorts are being taken off for scurfing, and also when the retorts are being prepared for a return to work.

With the intermittent type of vertical retort house, not fitted with a dust extraction plant, the sources of dust and smoke emission are more serious. Probably the worst is during the dropping of the carbonised charge from the retort into the receiving buggy. Dust is also caused when the coke pad is dropped into the retort before recharging with coal. Cleaning of waste heat boiler tubes can also cause dust where such boilers are incorporated in the plant.

Assuming the producers are of the step grate kind, with a manually operated coke charging skip, considerable dust will occur during producer cleaning and charging operations.

Smoke is also emitted from the main stack of this type of retort house during the actual retort charging and discharging operations, and although under normal conditions this period is short, it can be considerably lengthened if the charge 'hangs' during discharging.

Problems of horizontal retorts

In horizontal retort houses the smoke and dust problems are even worse, especially if the retorts are charged with the projector type of charger, and the retort discharge is pushed on to an open trough conveyor for removal to the quenching and screening plants. In this type of retort house, copious quantities of smoke and dust are emitted at almost every stage of the retort discharging and charging operations, and equally so during the charging of the producer. With all this rising dust and smoke the need for ventilation may necessitate openings in the walls of the building instead of windows, and this being so it is obvious that settled dust on girders, etc., will be windborne and create a nuisance even when charging operations are not in progress.

Coming to the second main cause of gasworks' dust—the transport and storage of coal and coke—most gasworks handle many thousands of tons of dust-producing materials. At many stages of their transit dust can be windborne to the extent of the works boundary, or beyond, to other places of accumulation; from here a stronger wind could later carry it over an even wider area. Similarly dust may be spread from every point of transport discharge, from every point of discharge on to conveyors and from wherever the coal or coke is elevated for stock piling.

The coke sizing or screening plant is also the cause of plenty of dust; the worst sources of dust are the actual sizing platform when screening the coke, the bulk loading

chutes, the bagging debreezing screens and the chutes when loading operations are in progress.

Solid fuel-fired boilers can be a considerable source of dust nuisance, particularly in view of the height of the stack necessary with these plants. Dust in the form of 'fly ash' can be emitted from the stack over a very wide area if the wrong type of fuel is used, or the forced draught steam jets are used at too high a pressure.

Heaps of clinker and ash which have been removed from the boiler furnaces are very prone to cause dust which will be blown long distances by a light wind.

Oxide breaking is not generally considered to be a major source of dust nuisance, but complaints have been received, and when studying the dust aspect as a whole it is advisable to give the oxide breaker some thought.

These then are some of the sources from which the dust and smoke nuisance can originate; a few suggestions of how to reduce the amount of dust and smoke which occurr are called for.

In the modern continuous vertical retort house equipped with dust extraction plant, dust from coke handling can be reduced by raising the moisture content of the coke by maintaining a pressure of say 20 p.s.i. on the water sprays to the retort coke chambers. It must be borne in mind, however, that the British Standard Specification requires that the mean moisture content does not exceed 9% in coke sold for domestic appliances.

The water leaving the seals on the retort bottom doors is very toxic, and with a spray nozzle size of $\frac{7}{32}$ in. and a water pressure of 20 p.s.i., the oxygen absorption figure can be as high as 30 parts per 100,000, so the works effluent disposal system has to be considered when increasing the coke moisture content by this method. Atomising water sprays should be fitted over the conveyor belt receiving the coke from the retort discharging buggy and also to other belts conveying coke or coal in the house. These atomising sprays should be of the automatic kind which only operate when actuated by the passing load on the belt.

The dust which is caused by the filling of retorts after scurfing can be minimised by using run-of-retort coke, and elevating it to the filling hopper just prior to its being used, thus reducing its drying-out time. The cleaning of waste heat boiler tubes should be carried out as frequently as practical, at least once a week. In this way the amount of dust emitted from the stack during the cleaning operation is reduced per unit time.

The cleaning of floors, stairways, mains, girders, etc., should be carried out by vacuum cleaners, the containers of which should be discharged into a small receiving bin kept under vacuum from the main dust extraction plant. This ensures that all dust so collected is not re-distributed in the building.

Dust washing plant

Attention to the dust washing plant which receives the extracted dust from the retort house is most important; the cells which collect the dust in the form of sludge should be regularly cleaned out and the water overflow from each cell should be checked by some responsible person before putting the plant into operation. As a further precaution against any fine dust passing the washing cells, an atomising spray should be fitted over the clean air discharge from the washer.

To reduce the amount of 'blue haze' and light smoke emitted when retorts are run out for scurfing, and likewise when heating up the coke charge and returning the retorts to working conditions, it is advisable to keep the retort connected to the foul main as long as the reduced calorific value of the make gas will allow. Similarly, retorts should be 'put on the main' as soon as possible after charging with coal after scurfing when the calorific value has risen sufficiently. It is possible, under certain conditions, to save one hour of smoke by adopting this practice.

In the intermittent vertical retort house, not fitted with any form of dust extractor plant, it is almost impossible to prevent the emission of smoke, with its consequent dust, during the discharging and charging of the retorts. All that can be done is to reduce the period of the emission by studying methods for completing the operation in a minimum time. A water spray on the top of the discharged coke buggy will assist in keeping the dust down during the discharging operation.

Coke used for padding the retort before dropping the coal charge can be wetter than that normally run to sizing plant, but care must be taken to ensure that the coke is not so wet as to cause damage to the retort brickwork by rapid cooling. Likewise, coke elevated to the producer charging hopper should contain sufficient moisture to prevent dust during the producer charging operations but without excessive moisture requiring extra producer fuel to gasify it.

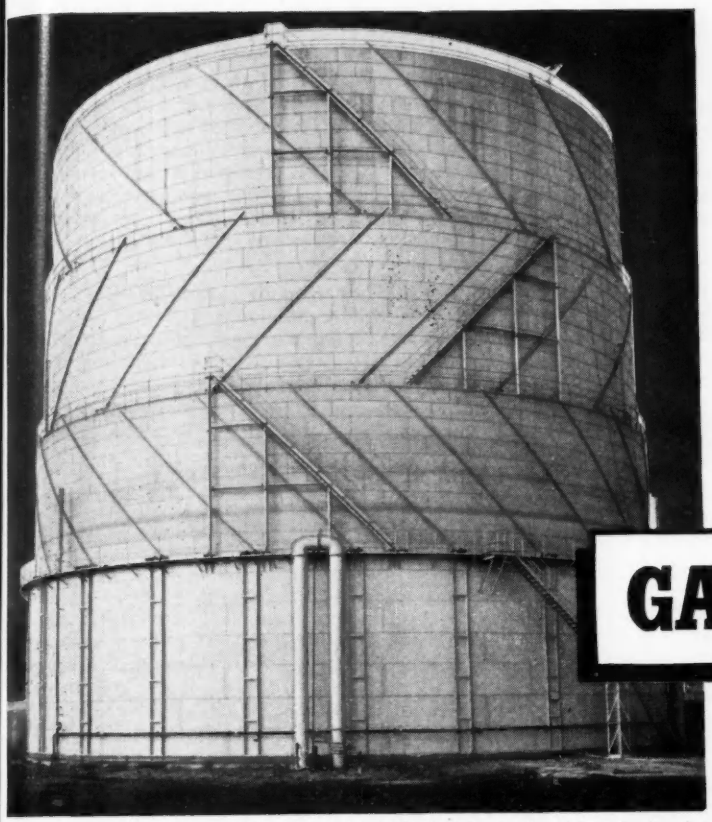
Precautions to prevent lengthy periods of dust emission from the retort house stack during waste heat boiler cleaning operations can again be achieved by arranging for a weekly tube cleaning schedule.

Nuisance time can be reduced

During the actual charging of the retorts with coal in this type of retort house, smoke is discharged from the main stack, after being conveyed there by a fume extractor main. Unfortunately there is no easy way of preventing this—one way being the introduction of an independent cyclone grit catcher—except to ensure the charging operations are carried out as speedily as possible; with a little time and motion study this difficult nuisance can be reduced by several minutes.

In this type of dust-producing retort house it is most important to pay particular attention to preventing accumulations of dust within the building, since any such accumulation will be windborne during any period of high wind. All platforms, stairways, girders, etc., should therefore be regularly cleaned—for preference by suction—and any untidiness discouraged, for any concentration of materials lying around not only encourages the collection of dust but prevents thorough cleaning in the vicinity. All coal and coke chutes within the building should also be kept free from small holes, since fine coal or coke dust falling through such holes constitutes a real source of dust distribution. Where movable glass windows are fitted it is important that they are kept in good working condition so that they can be shut against any prevailing wind to prevent dust from being blown outside the building. Where glass windows are not fitted, sheets of corrugated perspex fitted close up to the openings are preferable to blocking out the openings completely.

The prevention of smoke and dust emission from a horizontal retort house is almost impossible; a water spray fitted over the point of discharge on the coal charging belt will assist in blanketing the dust during the charging operation. This spray can be fed from a tank fitted on the top of the charging machine and operated automatically when the coal lever slide is opened by the machine operator. One way of reducing smoke and dust from the discharging side of the retort house during the charging of retorts is to leave about 12 to 18 in. of the old charge in the retort, and then, after pushing this back off the retort mouthpiece, close the retort door before projecting in the new coal charge. Although this may be effective in reducing dust, it tends to cause trouble with blocked



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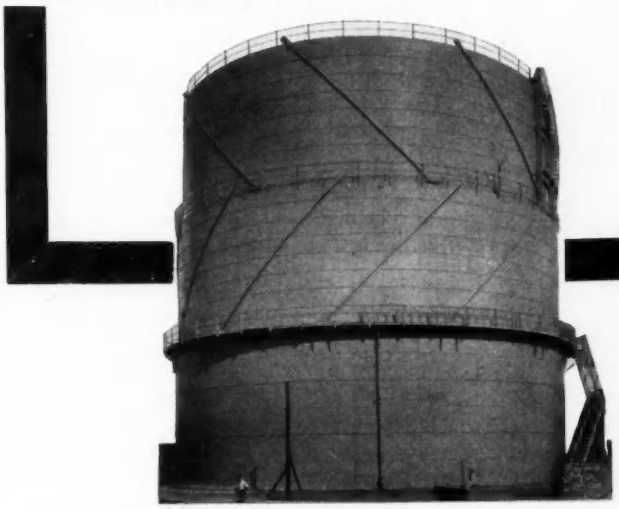

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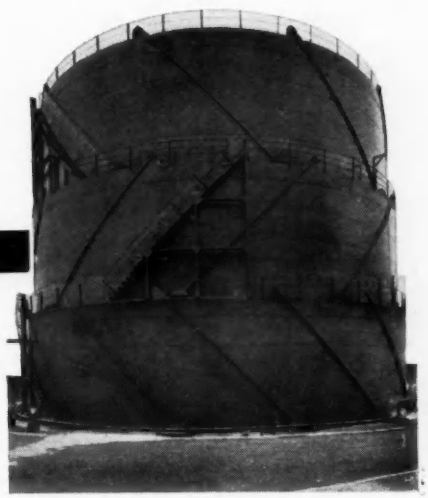

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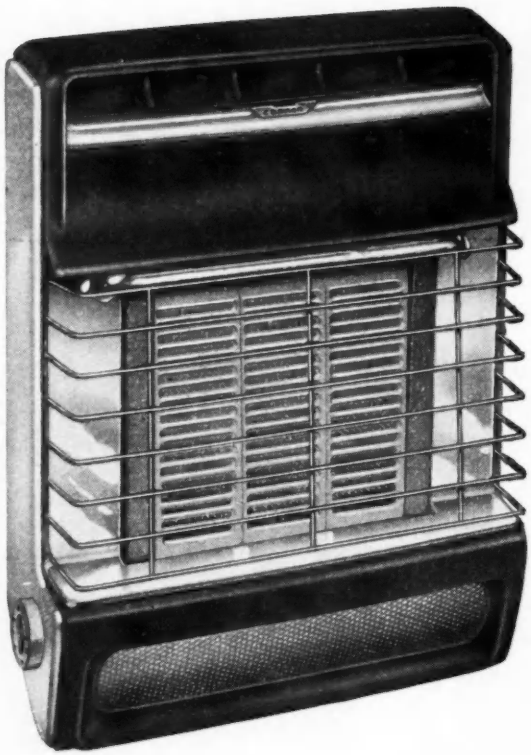

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ascension pipes, and in that way be responsible for another source of smoke emission. The nature of the various operations in this kind of retort house make the blocking of windows or openings very undesirable from a ventilation point of view, and the fitting of corrugated sheets of perspex to such openings is about all that can be done. Cleanliness and tidiness are, however, equally important in this case for the reasons previously mentioned, and the top of the retort setting should be cleared of accumulated dust at regular intervals.

Transport of coal and coke

Dust problems arising from the transport and storage of coal and coke on a gasworks can be more readily controlled. Admittedly, for every 20 cwt. of raw material in the form of coal that a gasworks receives, something like 32cwt. of a dust-producing material has to be moved, but except when very high winds persist, some care and thought can prevent much of the trouble. First and foremost all conveying vehicles must be carefully loaded to prevent the spillage of materials on the roads of the works, and, and should this happen employees should be encouraged to remove it from the road to prevent it being cruched into dust. A simple calculation proves that during the conveyance of 2,000 tons of coal, by say, a 5-ton lorry, only 4 oz. need to fall from the lorry, and be crushed on the road, for that to form nearly 1 cwt. of dust to add to the problem.

The building of a canopy and the free use of water sprays at the coal receiving elevator pit of the retort house is generally quite effective in preventing any distribution of dust at this point. Stock piles of coal and coke can be troublesome during high winds, and should always be situated as far as possible from any works boundary. The use again of atomising water sprays on elevators used for stock piling is recommended, and will be appreciated by the personnel so employed.

Coke sizing plants can be the cause of dust complaints from the neighbourhood round the works. This is due to some extent to the height at which the building housing the coke screens is usually built, thereby giving a wide coverage to any windborne dust. Atomising water sprays are not desirable over the actual sizing platforms for obvious reasons, but as previously stated, are best fitted to the conveyors feeding the screens, thereby increasing the moisture content of the coke passing over them. All windows in the building housing the screens should be kept in good condition and closed against the prevailing winds during screening operations. Where spiral chutes are incorporated to ease the fall of coke from the screens to the storage hoppers below, they should be kept in sound condition to prevent rapid descent, with further breaking of the coke and consequent dust. Cleanliness throughout the plant is also important.

At the lower levels of the plant, wind shields should be erected to prevent dust being blown from the bagging and debreezing platforms, and atomising sprays fitted to every bulk loading chute. It is recognised that the use of water sprays at various points of the coke handling plant will necessitate more frequent tests for moisture content of the coke sold to ensure that the various grades are within the requirements.

To prevent the discharge of 'fly ash' or smoke from the stack of solid fuel fired boilers, the boiler attendant must exercise considerable care with damper adjustments to keep pressure conditions right within the furnace, and when firing to lay a good even fuel bed upon the grate.

When firing with small materials of, say, predominantly below $\frac{3}{16}$-in. diameter, the rate of air supply to the grate should be such that no lift of dust occurs from the fuel bed to be carried over the furnace bridge.

It would be unwise to state the steam pressure required at the forced draught jets, since so much depends on the type of fuel used, and the general steam requirements of the works. The writer has known of instances where a 30-p.s.i. blast pressure has given 'fly ash' trouble from the boiler stack, but once a good working steam pressure for the forced draught jets has been established, it is advantageous to fit a reducing valve in the main steam supply to the jets to maintain the desired pressure.

Wherever possible no combustible rubbish or tarry materials should be burned in the boiler furnace, but where circumstances make this practice necessary, the secondary air slides in the furnace door must be used to ensure the smokeless combustion of such materials.

To keep down the wind-blown dust from ashes and clinker removed from the boiler furnaces, brick bins should be built as near to the boiler house as possible. These bins should be large enough to hold at least a 24-hour supply. An overfilled bin is not only untidy, but clinker, 'spreading' beyond the bounds of the bins makes the whole project superfluous. The walls of the bins should be fitted with good substantial water sprays so that the contents of the bins may be kept in a moist condition.

Similar bins should also be built at the water gas plant to receive not only the clinker from the generator, but also the 'fliers' collected from the grit catchers. Since this grit is collected in a very dry state and is not very absorbent to water, it is difficult to keep it moist enough to prevent easy dispersal in the atmosphere; a moist condition is better attained by mixing it with the water gas plant clinker within such bins.

Finally comes the question of wind-blown oxide dust during the mechanical breaking process. The very nature of the operation causes oxide to be thrown into the air in a dusty state, and for this reason it should never be carried out in the open, or near the works boundary, without first ensuring that suitable baffles and screens are erected. These screens and baffles tend to keep the dust in the vicinity of the breaking machine and the operators will probably need protective goggles. It is also advisable to remember when stocking oxide to keep the heaps well away from boundary walls to prevent wind-borne oxide becoming a nuisance in dry weather.

B.C.U.R.A. bibliography 1938-1959

IN connection with the attainment of the 21st anniversary of the British Coal Utilisation Research Association a bibliography of all its publications from 1938 to 1959 has been printed. Copies are available from the Liaison and Publications Officer, B.C.U.R.A., Randalls Road, Leatherhead, Surrey, price 5s. post free.

Intended for quick and easy reference, the bibliography indicates the location of accounts of the Association's past and current researches; it also reveals the pattern and trends of the work of the Association during its first 21 years.

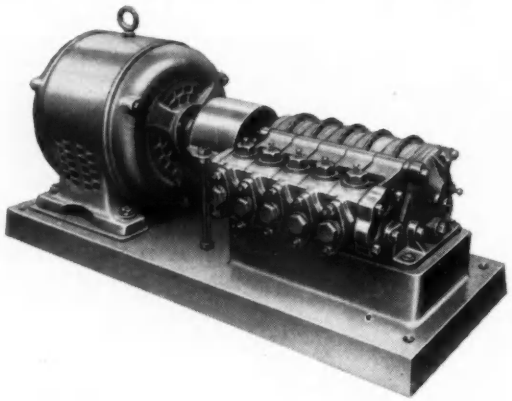
A full classified subject index gives a ready guide to the wide variety of topics studied; in all there are some 1,200 entries. The author index lists the names of past and present members of staff and their collaborators in the universities and elsewhere, with references to their published work. Included in the bibliography are details of the Patents taken out by the Association, the books it has published and the translations that it has prepared.

Technical developments

High speed pump

A development in the design of high-speed hydraulic pumps is announced by Joseph Evans & Sons (Wolverhampton) Ltd., to fulfil the requirements of engineers who need a high pressure pump of very small capacity.

The pump is of unit construction and is available with from three to six cylinders. Each cylinder has an output



of .6 gal. per minute and a six-cylinder unit would have an output of 3.6 gal. per minute. Delivery pressure is 1,000 lb. per square inch.

The eccentric shaft of the pump, which is mounted on roller bearings, is coupled directly to the motor, which runs at a synchronous speed of 1,000 r.p.m., through a flexible coupling.

The pumps are suitable for operation with water, water/soluble oil mixture or hydraulic oil as the working medium and the design can be adapted for use with other liquids. The units can be provided with spring loaded relief valves, or alternatively with automatic unloading valves which enables them to run light when operating against closed stop valves.—*Joseph Evans & Sons (Wolverhampton) Ltd.*

Dust collector

TO meet the demand for a wet type dust collector in the solution of recovery problems for which a dry cyclone or a bag type filter is either not suitable or not warranted, the Visco Engineering Co. Ltd. has acquired the exclusive manufacturing and selling rights for the 'Visco-Handte' patented design in the United Kingdom and British Commonwealth.

This collector is a self-contained unit manufactured in various standard sizes for a range of duties. A number of units can be grouped together according to the volumes of dust laden air to be handled. Each standard unit consists of a substantial sheet steel cylindrical casing with an easily removable sludge disposal bin, built-in cyclone and water eliminator, the whole surmounted by the motor driven exhaust fan. It is complete with simple floor-mounting supports, water connections for filling the unit and hose for cleaning the collector periodically. Large installations comprising a number of units can be provided with a centralised sludge disposal system, or if preferred, each unit can be fitted with a substantial sludge valve, through which the sludge is deposited into a mobile disposal vehicle. In such a case the bin forms part of the casing.

The 'Visco-Handte' collector combines centrifugal and wet collection in the same unit. The dust laden air is drawn into the unit tangentially, the heavier dust particles being deposited in the water by centrifugal action, which also creates a turbulence in the water, breaking it up into a 'rain' with which the dust laden air cannot fail to come into contact. The finer dust particles, which have not been separated out by centrifugal force, are thoroughly wetted in the vortex of the cyclone. A centrifugal water eliminator which is incorporated causes the dust laden drops of water to be deposited in the sludge bin, and cleaned and water free air to be discharged to atmosphere. In many installations overseas, the cleaned air is returned to the work-room without any objectionable results.—*The Visco Engineering Co. Ltd.*

Helical pipes

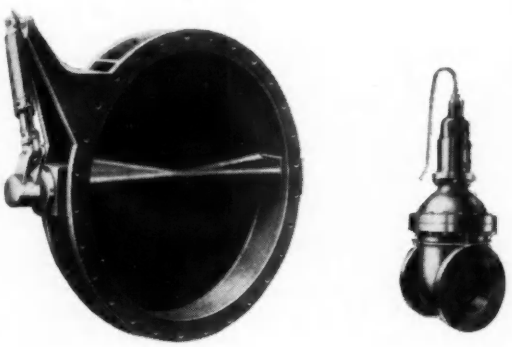
SUITABLE for gas, water or oil, continuously welded helical pipe, manufactured by the Jarrow Welding & Boiler Co. Ltd., in sizes ranging from 5 in. to 12 in. diameter, is now available in any specified length. These pipes fulfil the various requirements of all the British, American and European Standards bodies, and they are suitable for all industrial uses.

In the manufacture of these pipes strip steel is formed into a spiral with the edges exactly aligned and a continuous weld (inside and outside, or outside only) completes the pipe. In addition to advantages of strength and lightness, these helical pipes offer savings in cost of up to 33% when compared with conventional spun cast pipes.—*James Harwood & Company.*

Valve control

HYDRAULIC & PNEUMATIC LTD. have recently introduced a further variation of their actuator which is suitable for hydraulic or pneumatic power operation of pipe-line valves.

The actuator, which is a patented device, is designed for easy fitment to standard sluice, globe and butterfly valves, and enables more simplifying piping installations than



hitherto used with conventional cylinders. Flexibility of design is such that control may be of manual, hydraulic, pneumatic or electrical nature, and either open-shut or positional control can be easily arranged. The requirement to hold valves at any desired position without the complexity of external lock valves, is a further advantage of this device.—*Hydraulic & Pneumatic Ltd.*

Water treatment

AN agreement has been signed between Head Wrightson & Co. Ltd., the Teesside engineers, and the Belco Division of Bogue Electric Manufacturing Co. of Paterson in the United States, which will enable Head Wrightson to design, engineer and build water treatment and trade waste disposal plants throughout the world, excluding the North American continent.

Belco is well established in this field, and by merging the resources of the two companies it will be possible to offer industry the services of an organisation with both outstanding design experience and manufacturing technique, especially in the field of fully automatic processes. The American company has installed some of the largest demineralisation plants in the world at chemical plants, oil refineries and at nuclear stations and Head Wrightson's existing interests in these fields will permit them to expand the services they now offer.—*Head Wrightson Processes Ltd.*

Potentiometer recorder

THE Ether Xactrol potentiometer recording controller has been designed for accurately controlling and measuring temperatures of −200°C. up to +2,000°C. It is equally suitable for measuring variables such as speed, strain, pressure and hydrogen ion concentration, as well as any quantity that can be expressed as an electrical signal. An exclusive feature of the instrument is the unique zero-load and zero-differential control system.

In most control instruments of this type, the control action is obtained through a mechanically operated snap-action switch or similar device, which necessitates a mechanical force to operate it.

Failure through mechanical wear or metal fatigue, unless expensive additional precautions are taken, may occur when the temperature of the furnace is rising, with the possibility of a continued temperature rise until the furnace has burnt out. To overcome such serious hazards the Xactrol zero-differential control system operates through sliding contacts on a variable positioning pick-up track which is electrically connected in series with the control relay. Among the other advantages of the design are zero-load even at the control point, wiping action continuously cleaning contacts and no mechanical linkages or snap action switches; in addition the instrument is adjustable over its full span.—*Ether Ltd.*

Corrosion engineering

CORROSION Technical Services Ltd., in association with Soil Mechanics Ltd., have acquired the fixed assets and trade mark of Corrosion Proof Products Ltd. The technical staff of Corrosion Proof Products Ltd. have also joined the company.

This company now propose to extend further their activities in the field of corrosion engineering while at the same time specialising in the manufacture of chemical-resistant cements and membranes, and the construction of chemical-resistant floor tiling and plant linings, for which Corrosion Proof Products Ltd. had become widely known.

The range of chemical-resistant cements, membranes and jointing materials will continue to be marketed under the trade mark of Corro-Proof.—*Corrosion Technical Services Ltd.*

GAS JOURNAL

Readers' Enquiry Service

Details and coupons are given on the backing page

Frankibored piles

HIGH column loads, a feature of modern multi-storey building design, have brought about the development of bored piles of large diameter and exceptional bearing capacity. By using a patented drill known as the 'turn grab,' this type of foundation piling can be installed efficiently and economically. The turn grab is equally efficient in any type of ground from mud, silt, sand, etc., to hard gravel and soft rock, can be used to complete very deep borings irrespective of variations in the subsoil layers and other hazards which may be encountered. The Franki process permits the installation to great depth of large diameter bored piles able to carry very high individual loads. The standard equipment can install them to a depth of 100 ft.—*Frankpile Ltd.*

Venturi scrubbers

CHEMICAL Construction (G.B.) Ltd. announce that a recent agreement with their U.S. parent company enables them to undertake P—A (Pease-Anthony) venturi and cyclonic scrubber work in the United Kingdom and the Commonwealth countries on an exclusive basis. Enquiries for this type of gas cleaning equipment should now be addressed to this company.—*Chemical Construction (G.B.) Ltd.*

Pressure gauge

A NEW feature for the Abbirko stand-up pressure gauge has just been introduced by the makers as a result of a suggestion made by a gas fitter. To facilitate quick temporary attachment of the instrument to gas meters, cooker splashbacks or other appliances during tests, it is now available with a rubber suction cup fitted to the rear of the case. This enables the pressure gauge to be easily positioned at eye level in cases where it is not convenient to use the stand provided.—*Abbott, Birks & Co. Ltd.*

Trade publications

A NEW publication by Oxley Engineering Co. Ltd. describes and illustrates their range of all-welded gasholders, with particular reference to their patented overflow and return ducts. Also obtainable from this firm is a useful calculator which indicates the dimensions and all essential data of gasholders from 1,000 to 6 mill. cu. ft. capacity.—*Oxley Engineering Co. Ltd.*

* * *

A booklet describing Fomescol, the new type of surface active agent for furnace fuel oil demulsification, emulsion prevention and tank cleaning, has just been published. This product has been developed as a result of the collaborative research work between the Department of Scientific and Industrial Research and Glovers (Chemicals) Ltd. of Leeds.

Fomescol may be used in three ways: To break emulsions already formed, or to treat wet oil recovered from the top of oily-water separators; as a tank cleaning agent; as an emulsion preventative in dual purpose tanks.—*Glovers (Chemicals) Ltd.*

Readers' Enquiry Service

If you would like more information on products and services mentioned in the advertisement or editorial pages of the 'Gas Journal', fill in the coupons below, *one for each enquiry*, and send in unsealed envelope to **'Readers Enquiry Service', Gas Journal, 11 Bolt Court, Fleet Street, London, E.C.4.**

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GAS COUNCIL FORMS NEW DEVELOPMENT & PLANNING SECTION

THE announcement by the Gas Council that it has decided to establish a development and planning section is seen as a development, if not a change, in policy. So far, major research work has been carried out at the two research stations at Watson House, London, and Solihull, while area boards have carried out their own development requirements.

The laboratory at Solihull undertakes gas production process research and has carried out experiments at the. pilot-plant stage of coal hydrogenation and other means of total gasification, including the slagging gasifier and the Lurgi process.

Pressure gasification

Experiments on the pressure gasification of oils and peak-load gas production by a catalytic oil process under pressure have also been carried out there, as well as work on safety devices for gas-fired industrial ovens.

The most important work done at Watson House has been on appliance testing and the development of gas-fired industrial equipment.

The possibility that the direction of these two research stations will come under the direction of the new planning section seems unlikely; principal main development and expansion of the industry in the future will be by means of a thorough investigation into new sources of raw material for gas-making and the development of plant for processing them.

More probable is that the new planning section will give all its time to weighing up the relative merits of possible new processes and planning their development against the background of commercial policy.

Saving freight

It would, therefore, aim at accelerating the commercial exploitation of new gas-making processes by which large-scale plants with very high potential gas outputs can be set up at collieries, thus saving heavy freight charges.

The section would also be in a position to carry through all the preliminary planning for the laying of a possible national grid system in connection with these new gas production centres.

The intricate co-ordination between area boards in the event of such a grid system being built—or between the boards and a centralised production body—could be planned well in advance by a section such as the one now being set up.

In the near future the Gas Council will be inviting applications for the appointment of a development engineer to take charge of the section.

NEWS SUPPLEMENT

NALGO MOVES TO NEW LONDON H.Q.

THE National and Local Government Officers' Association, Britain's biggest 'black-coat' trade union, moved this week into new London headquarters at NALGO House, Harewood Road, Marylebone, N.W.1—just outside Marylebone station.

NALGO's first 'office,' in 1909, was a box for letters screwed to the wall of a solicitor's chambers in Ludgate Circus.

For the past 12 years, the Association has been housed in ten Nash houses at York Gate, Regents Park — imposing in appearance, but now inadequate in view of NALGO's rapidly expanding membership (from 190,000 to 263,000 in the last ten years).

Pipe-work engineering division set up by Stewarts & Lloyds

AN important development involving the creation of a new division has taken place within Stewarts & Lloyds, the steel tube company. This is the setting up of the pipe-work engineering division which will be responsible for the making and marketing of all forms of manipulated pipe-work.

The division will be under separate management, with its own sales, engineering and manufacturing departments, and will command the services of highly skilled teams of engineers, designers and craftsmen.

The services offered by this new division—P.E.D., as it will be known—will include the design, manufacture, erection or site fabrication of entire pipe-work installations with ancillary equipment or the supply of pipe-work to customers' own drawings or from dimensions taken on site. A radiography service is also available to customers for the non-destructive testing of fabricated parts.

Officers of the new division, which will be under the chairmanship of Mr. James Carson, a director of Stewarts & Lloyds, will be:—

Managing Director — SIR ALLAN ELIOTT LOCKHART; General Manager, Sales and Engineering—MR. G. T. T. RHEAM, O.B.E.; General Manager, Production—MR. A. H. KYNASTON. The division is to be launched with a sales and advertising campaign. A ten-minute film called 'Industrial Pipework' has been prepared and is available to interested persons.

From 1.30 p.m. today, the telephone number of the Gas Council will be changed to

BELGRAVIA 4321

Tail gases for Onia-Gegi units in Australia

A NEW gasworks is to be built at Geelong, near Melbourne, Australia, by Humphreys & Glasgow Ltd. The works, due to go into operation next year, will consist of two Onia-Gegi catalytic reforming units, each producing 1.5 mill. cu.ft. of town gas a day.

The units will use tail gases piped from a Shell oil refinery five miles away. As an alternative feedstock, liquefied petroleum gas, for which storage facilities are being installed, will ensure continuous output when the refinery is shut down for maintenance.

The Geelong Gas Company's new works will be the first in Australia to use the Onia-Gegi process, which Humphreys & Glasgow have designed and built in many cities throughout the world. Geelong, with a population of 80,000, is Victoria's second largest city. As well as an important industrial centre, it is the chief export harbour for the State's wheat and wool industries.

SALES LEAP

January sales on the home market of domestic refrigerators totalled 80,685. This compares with 44,918 for January, 1959, representing an increase of 82%. There is also an increase in export sales of domestic models from 6,263 to 6,852.

New tariff and budget scheme for W. Midlands householders

AN optional two-part tariff for domestic consumers is to be introduced by the West Midlands Gas Board from July 1. Based on a standard quarterly charge of 39s. plus a rate of 1s. to 1s. 3d. a therm, the new tariff will benefit consumers whose quarterly bill is now more than £5 10s.

Announcing the new tariff on Monday at a meeting of the West Midlands Gas Consultative Council, Mr. G. le B. Diamond, Chairman of the Board, said that due to improved economic conditions many more people were more 'comfort-minded' than ever before.

Mr. Diamond also announced that the Board would introduce a 'budget payment' plan under which consumers under the new tariff could spread their gas costs evenly over the year by equal quarterly or monthly amounts.

Under the present tariff structure there are four area price groups: No. 1—The Potteries and North Staffordshire; No. 2—Birmingham and Smethwick; No. 3—Solihull, the Black Country, Tamworth, Lichfield, Stafford and Stone; No. 4—Herefordshire, Shropshire, and the rest of Staffordshire, Warwickshire and Worcestershire. Existing charges are:

Group	1st 12 therms a quarter	Over 12 therms a quarter
No. 1	2s. 1d.	1s. 5d.
No. 2	2s. 6d.	1s. 7½d.
No. 3	2s. 8d.	1s. 8½d.
No. 4	2s. 10d.	1s. 9½d.

Consumers who change to the new tariff will pay the 39s. standing charge in all groups, but the price per therm will vary. For No. 1 group it will be 1s., for No. 2 1s. 2d., for No. 3 1s. 2½d. and for No. 4 1s. 3d.

Protective wear could have saved 25,000 injuries

THE wearing of suitable footwear or headgear and the use of eye protection might have prevented 25,000 injuries—a seventh of all reported injuries—in 1958, the last year for which full figures are available, according to Mr. T. W. McCullough, the Chief Inspector of Factories.

Writing in the *Financial Times* recently, he said that less than 15% of the 167,697 accidents reported from industries covered by the Factories Acts which kept people away from work for more than three days, were caused by power-driven machinery.

'There is then, a challenge, a challenge to all connected with industry or otherwise concerned to bring these non-machinery accidents tumbling down.'

Sixty per cent. of the total number of reported foot injuries occurred in industries—shipbuilding, engineering, building and civil engineering work, and work at docks—where the wearing of safety boots should be regarded as a routine measure.

There were nearly 1,500 injuries to the skull and neck, most of which could have been prevented by the wearing of safety headgear in places where things are likely to drop from above.

There were 6,400 eye injuries, practically all of which would have been prevented by the use of suitable goggles or screens.

SIMON SHAREHOLDERS ADVISED ON MERGER

THE Boards of Henry Simon (Holdings) Ltd., and Simon-Carves Ltd., have agreed to recommend to their rsepective shareholders the complete merger of the businesses known as the Simon Engineering Group.

Some aspects of the merger are being further examined and the exact terms await the final results of both companies for 1959, which will be available to the directors by the end of March.

The merger will, however, provide for the creation of a new holding company, the elimination of inter-company shareholdings and the withdrawal of cash which is surplus to the requirements of the new group for the benefit of shareholders.

METER PAID-OFF AFTER 95 YEARS' SOLID SERVICE

IN good working order after 95 years' service is a gas meter which has been removed to make way for a 1960 model in a flat at Temple Park Crescent, Edinburgh

Inscribed on the meter's identification discs are the words:

Property of the Edinburgh and Leith Corporations Gas Commissions No. 27440. Alder's improved dry gas meter, 1865, Edinburgh.

The original red wax seal of manufacture is still intact, proof that the meter had performed without attention or interruption for the best part of a century.

Investigation revealed that the meter was made in the original Abbeyhill works of Alder's, now better known as Alder & Mackay Ltd. of New Grange works, Gorgie.

Another outlet for gas

AN electricity board engineer had an unusual experience while working on one of the street lamps at Mosbro' Hill, Eckington, Derbyshire, when a jet of burning gas suddenly shot from the lamp-holder.

After the incident people in the neighbourhood admitted having smelt gas for a fortnight, although not one of them troubled to notify the Gas Board.

Investigation showed that a main had become fractured, enabling gas to filter through the ground and find its way out through the inside of the electric street lamp.

Power-Gas overseas contracts

GROUP LANDS ORDERS FROM CANADA, INDIA, RHODESIA

P.G. ENGINEERING LTD. (member of the Power-Gas Group) of Stockton-on-Tees, has recently received contracts for process plant from Canada and India of a total value exceeding £1¼ mill.

Brockville Chemicals Ltd. of Canada has awarded a contract to P.G. Engineering Ltd. and their associated company Power-Gas Canada Ltd. of Montreal for the complete design, construction and commissioning of a hydrogen plant at a new works now in course of erection near Maitland, Ontario.

The plant is scheduled for completion early in 1961 and the value of this contract is approximately 1,800,000 dollars.

P.G. Engineering Ltd. has also received a contract from Fertilisers & Chemicals, Travancore, Ltd., South India, for a Texaco partial oxidation, gasification plant to produce carbon monoxide and hydrogen, followed by high pressure CO conversion, removal of CO_2 and residual H_2S by water scrubbing.

Initially, the plant will process naphtha, but is laid out so that if fuel oil is to be used the additional acid gas purification plant can be added. One of the interesting features of this plant is that carbon produced in the Texaco generator is recovered and recycled.

Two member companies of the Power-Gas Group, Ashmore, Benson, Pease & Co. Africa (Pty.) Ltd. of Johannesburg and P.G. Engineering Ltd. of Stockton-on-Tees are to carry out an order valued at over £1 mill. for the Rhodesia Broken Hill Development Company Ltd. The order is for a zinc and lead I.V. furnace which will be installed at Broken Hill, Northern Rhodesia.

PERSONAL NOTES

MAJOR W. R. BROWN is retiring from the chairmanship of the Power-Gas Corporation, Ltd., Stockton-on-Tees, after more than 30 years' service with the firm. He will be succeeded by MR. C. E. WRANGHAM, 53-year-old Vice-Chairman and Managing Director. Major Brown became a director of the firm in 1952, vice-chairman in 1956, and chairman in 1957. Mr. Wrangham is a director of several other companies both inside and outside the Power-Gas organisation. Major Brown is to continue as an adviser on the Board of Ashmore Benson Pease & Co. Ltd., Stockton, a subsidiary of the Power-Gas Corporation, Ltd.

COMING EVENTS

March 24.—MIDLAND JUNIORS: Half-day visit to the works of Guest, Keen & Nettlefold Ltd., Darlaston.

March 25.—NORTHERN JUNIORS: Joint meeting with North of England Section, I.G.E. Paper on underground storage, by E. Crowther.

March 25.—MANCHESTER AND DISTRICT SECTION, I.G.E.: Queen's Hotel Manchester. Lunch at 12 noon, followed by 'The Future of Coal,' by F. Wilkinson.

March 26.—MIDLAND JUNIORS: Victoria Hotel, Wolverhampton. Annual dinner 6.30 p.m.

March 26. — MANCHESTER JUNIORS: Visit to the new Hoscar sewage works near Parbold, followed by a meeting at the gas showrooms, Wigan. Paper on gasworks effluent treatment by C. R. Hollingshead, Chief Chemist of the South Lancashire Group

March 29.—THE SOCIETY OF INSTRUMENT TECHNOLOGY: Manson House, 26, Portland Place, London, W.1. 'Application of Transistors in Instrumentation,' by G. G. Bloodworth. 7 p.m.

March 29. — LONDON AND COUNTIES COKE SALES CIRCLE: Connaught Rooms, Great Queen Street, Kingsway, W.C.2. Coke Salesmen's Conference.

March 31.—NORTH THAMES G.C.C.: City Hall, Westminster. Council Meeting.

April 2.—MANCHESTER JUNIORS: Visit to Garston works, followed by a paper on 'Some Applications of Statistics to the Gas Industry,' by H. Crompton. 2.15 p.m.

April 6.—YORKSHIRE JUNIORS: Chesterfield. Visit to Staveley Iron & Chemical Co. Ltd.

The North Western Gas Board is co-operating with private builders at Crewe and offering gas central heating in houses and bungalows on a new housing estate on the north side of Hungerford Road.

'Immense contribution of I.G.E. to gas industry'

In the council room of the Institution, from left: Mr. Wood, Mr. Melvin, and Mr. G. E. Currier, O.B.E., Honorary Secretary.

MR. RICHARD WOOD, Minister of Power, visited the headquarters of the Institution of Gas Engineers at Grosvenor Crescent, London, recently. After inspecting the library and reading room, the Minister joined members of council who were in session.

The President, Mr. D. D. Melvin, made a short speech of welcome, in which he explained the objects and activities of the Institution and introduced each member of council in turn to the Minister. A brief account of the work of the committees of the Institution was given by the respective chairman present.

Varying problems

The Minister, replying, said: I would like to put on record what I have heard about the work of the Institution in the past and the immense contribution it has made to the success of the industry.

'I have realised, as I have travelled about this island in the last few months, the way in which problems vary from one part of the country to the other. It must be of immense value to the industry to have an Institution of this kind which can pool knowledge and offer to all in the industry a viewpoint based on the sum of experience throughout the island.

Two great needs

'I think the need for the Institution will be just as great in the future. The two great needs in the future are going to be to attract the right kind of people to the industry and to keep pace with technical changes and conditions that will become more and more competitive.

'In the past there has been close co-operation between the Ministry and the Institution. I hope that it will continue and prove of some value to you. It certainly will be of immense value to us.'

The Senior Vice-President, Mr. H. S. Cheetham, handed to Mr. Wood, as a memento of his visit, a specially-bound copy of an illustrated brochure outlining the history and work of the Institution.

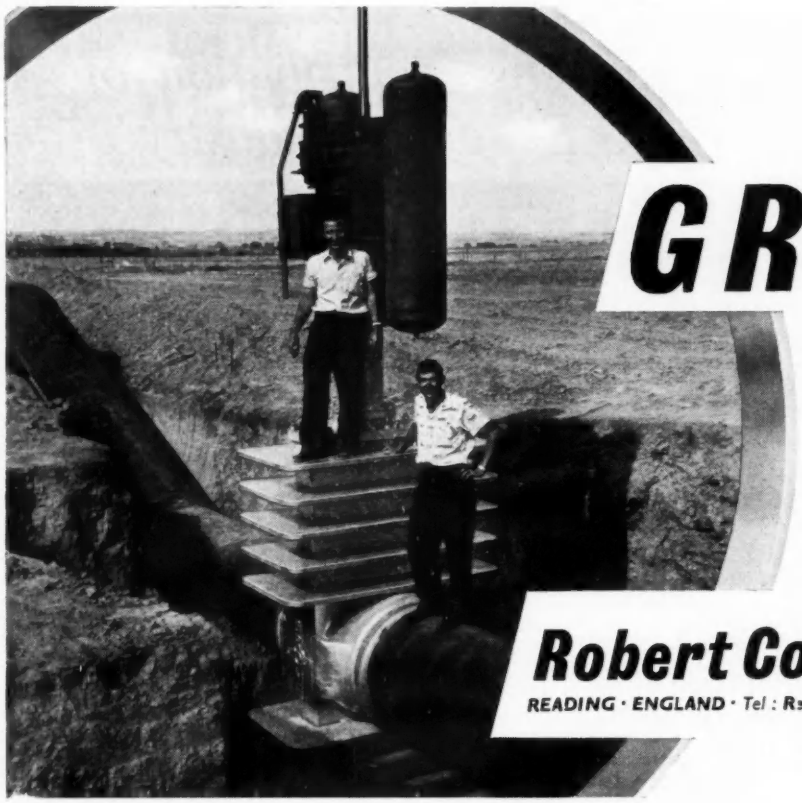
COLOGNE ENERGY CONFERENCE

AN international conference on 'International interdependence on economics and energy' will be held on April 6 and 7 at the University of Cologne, under the auspices of the Institute of Energy and Economics, a department of the university.

Among titles of papers to be read and discussed are 'Comparisons in energy economics in Western Europe'; 'Improvements in economics in energy uses and their reaction to energy production'; 'International aspects in the economics of gas supply' and 'The international situation in the economics of coal marketing.'

OBITUARY

MR. GEORGE WOOD, C.B.E., who was vice-president of Thos. W. Ward Ltd., has died after a long illness. He joined Thos. W. Ward as a boy in 1897. In 1950 he was appointed chairman, but four years later felt the need to take a less active part in the management of the firm and relinquished the office to become vice-president. During his 57 years of active participation in the affairs of the Ward group Mr. Wood was chairman or managing director of several subsidiary companies, but had relinquished most of these appointments in the last few years.



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